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APPRENTICESHIP TRAINING

ELECTRICIAN Program


Alberta

MANPOWER

Apprenticeship and Trade
Certification Division

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COURSE OUTLINE

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ELECTRICIAN TRADE

THE GOAL OF APPRENTICESHIP TRAINING

To develop a competent tradesman who, through skill and knowledge, is capable of installing and maintaining systems and equipment in building for the distribution and utilization of electricity for power and lighting purposes.

THE PRODUCT OF APPRENTICESHIP—

a graduate who will:

- * have a thorough knowledge and understanding of electrical theory and its application to lighting, power and control equipment.
- * layout and install the various electrical circuits in residential and commercial buildings.
- * implement the instructions given in blueprints and mechanical drawings pertaining to electrical installations.
- * be thoroughly familiar with the safety requirements for electrical installations.
- * be capable of troubleshooting and maintaining electrical systems and equipment.
- * use competently the test instruments and various tools necessary to perform tasks.
- * be familiar with the work of other tradesmen in the construction industry and with the different types of building construction.

ELECTRICIAN APPRENTICESHIP INFORMATION

Basic Requirements:

- * Indenture for four periods of Trade experience.
- * Attend an 8 week technical training course in the first, second and third periods and a 12 week technical training course in the fourth period.
- * Fulfill the requirements for each period including 1800 hours of work experience inclusive of time spent at the training course; successfully complete the technical training course and obtain a satisfactory employer's report.
- * Education — a minimum requirement is that he has passed mathematics 20 or its equivalent, or mathematics 23, or pass on an equivalent entrance examination as prescribed by the Trade regulation.
- * Age — the minimum age for apprentices is 16 years. There is no upper age limit.

Credits:

- * Accelerated patterns of apprenticeship may be granted for related technical training and/or experience.

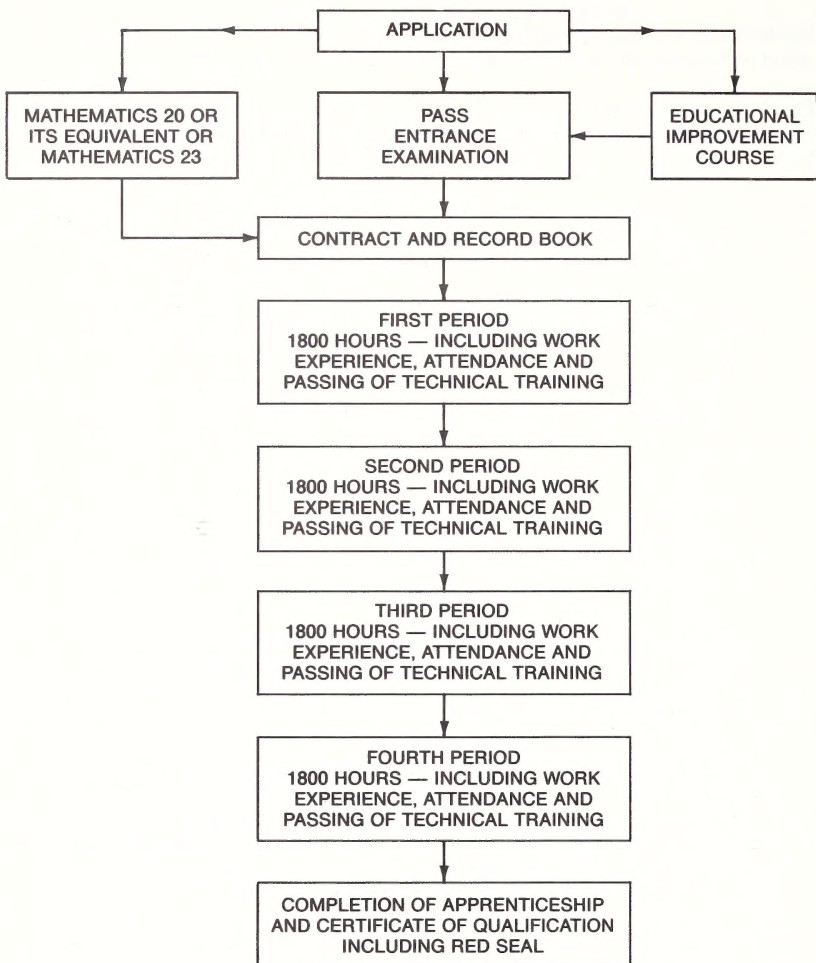
Benefits:

- * Apprenticeship is a learning-while-earning program. During the apprenticeship period, while working at the trade, apprentices are assured by regulation of a minimum percentage of the prevailing journeyman rate: 45% during the first period, 55% during the second period, 65% during the third period and 75% during the fourth period. Progress from one rate to the next takes place only after successful completion of all the requirements for each period (details are outlined in the Record Book).
- * All apprentices 17 years of age and older are normally eligible for training allowances while attending technical training courses. These allowances are funded by the Canada Employment and Immigration Commission.
- * Administrative procedures establishing the amount of training allowance is complex and can vary with an individual's circumstances. Contact a local Canada Employment Centre for details.
- * An apprentice who successfully completes the program will graduate with an Alberta Completion of Apprenticeship Certificate and a Certificate of Proficiency. It is also possible for the graduate to obtain an interprovincial Red Seal by passing an additional examination and so become recognized as a qualified tradesman throughout Canada.
- * The most significant benefit to the graduate apprentice is that he is well trained in technical and practical aspects of the trade and is able to make a worthwhile and productive contribution to society. Society in return, will provide an opportunity for livelihood.

DIRECTIONS FOR PROSPECTIVE APPRENTICES

- * Contact your nearest Apprenticeship and Trade Certification Division for detailed information and counselling (see list of offices on page 41).
- * Obtain an application form from the Apprenticeship and Trade Certification Division and neatly complete, in full, the information requested of the apprentice.
- * Persevere in the search for apprentice employment and upon obtaining employment, give the application to the employer. It should be completed and returned to an Apprenticeship and Trade Certification Division forthwith.
- * Any time credit, for previous experience in the Electrician trade, should be discussed with the employer and requested on the application form by the employer.
- * Attach to the apprentice application a copy (transcript) of the marks for your last year of school. If transcripts have been lost, contact Alberta Education for information on school transcripts.
- * A contract of apprenticeship is entered into between the apprentice and the employer and should be signed within 90 days after the apprentice application has been approved. If contracts have not been issued within this time, contact the Apprenticeship and Trade Certification Division.
- * Before signing the contract of apprenticeship read the complete document carefully — know your obligations and responsibilities to your employer — know the employer's obligations and responsibilities to you — feel confident you have selected the right occupation.
- * Know when you will be expected to attend classes and be prepared to attend. In early May of each year, School Schedules are sent to you and your employer. The employer also receives a class selection card for you, which is to be completed and submitted for scheduling. Information on procedures also accompanies the above. Confirmation on the date you actually get scheduled and/or the Official Notice will follow at the appropriate time(s).
- * Prepare in advance for the financial obligations required of you during school training. Reference materials and school supplies are paid for by the apprentice.
- * While an apprentice, it will be your responsibility to respond promptly to mailed directions and requests from the Apprenticeship and Trade Certification Division.

APPRENTICESHIP ROUTE TOWARD CERTIFICATION



APPRENTICESHIP COMMITTEE STRUCTURE

Electrician Provincial Apprenticeship Committee

The Provincial Apprenticeship Committee for the Electrician Trade is comprised of members from Local Apprenticeship Committees from the cities of Edmonton, Calgary, Lethbridge, Grande Prairie, Vermilion, Fort McMurray and Hinton.

This Committee is concerned with the policies that guide the program and make recommendations to the Apprenticeship and Trade Certification Board and the Director of Apprenticeship and Trade Certification Division in the following areas:

- * Contribute current information relative to changes in the trade and requirements of industry.
- * Make recommendations for changes to existing trade regulations.
- * Assist in updating of the training program through recommendations for revisions to the course outline and attendant examinations.

Electrician Local Apprenticeship Committee

Local Apprenticeship Committees are concerned with individuals and trade situations within a local region. Meetings are held throughout the year to make recommendations and to discuss problems relating to the apprenticeship program. Members who serve on committees are nominated by employer and labour organizations, and membership is equally divided into employer and employee representation in accordance with The Manpower Development Act.

Apprenticeship Committee Members:

Mr. O. Jorgensen — Edmonton — Employer
Mr. B. Clarke — Edmonton — Employer
Mr. R. Lynn — Edmonton — Employee
Mr. P. Salisny — Edmonton — Employee (Alternate)
Mr. E. Stelmaschuk — Edmonton — Employer
Mr. J. Dingman — Edmonton — Additional
Mr. G. Chaschaturian — Edmonton — Employee
Mr. T. Barker — Edmonton — Employer (Alternate)
Mr. G. Coppinger — Edmonton — Additional
Mr. G. Thys — Edmonton — Employer
Mr. J. Robertson — Calgary — Employer (Alternate)
Mr. D. Harley — Calgary — Additional
Mr. R. Gilhooly — Calgary — Employer
Mr. R. Codd — Calgary — Employer
Mr. G. Ogilvie — Calgary — Employee
Mr. J. Briegel — Calgary — Employee
Mr. J. Last — Calgary — Employee (Alternate)
Mr. B. Skrapec — Calgary — Employee
Mr. R. Stuve — Fort McMurray — Employer
Mr. G. Whitfield — Fort McMurray — Employee
Mr. J. Bendfield — Fort McMurray — Employee (Alternate)
Mr. A. Turnbull — Fort McMurray — Employer (Alternate)
Mr. N. Cookshaw — Grande Prairie — Employer
Mr. B. Reddekopp — Grande Prairie — Employee
Mr. W. Alloway — Grande Prairie — Employer (Alternate)
Mr. C. Toutant — Grande Prairie — Employee (Alternate)
Mr. H. Christie — Lethbridge — Additional
Mr. B. Hendriks — Lethbridge — Employer
Mr. L. Bosch — Lethbridge — Employer
Mr. G. Osberg — Lethbridge — Employee
Mr. D. Banack — Lethbridge — Employee
Mr. R. Steele — Lethbridge — Employer (Alternate)
Mr. J. Brittle — Lethbridge — Employee (Alternate)
Mr. L. Galick — Vermilion — Employer
Mr. F. Calvert — Vermilion — Employer
Mr. M. MacLean — Vermilion — Employer
Mr. G. Olson — Vermilion — Employee (Alternate)
Mr. M. Eliuk — Hinton — Employee
Mr. D. Hulbert — Hinton — Employee (Alternate)
Mr. B. Mahon — Hinton — Employer
Mr. F. Armella — Hinton — Employer (Alternate)

ELECTRICIAN PROGRAM COURSE OUTLINE

This outline has been prepared in accordance with recommendations from the Provincial Apprenticeship Committee for the Electrician Trade in the Province of Alberta.

The outline was updated following consideration given to recommendations and suggestions from:

- Local Apprenticeship Committees
- Representatives from training institutes
- Curriculum Sub-Committee from the Provincial Apprenticeship Committee

PROCEDURES FOR RECOMMENDING REVISION(S) TO THE COURSE OUTLINE

Any concerned citizen or group in the Province of Alberta may make recommendations for change by writing to Apprenticeship and Trade Certification Division, Edmonton.

It is requested that recommendations for change refer to specific areas and state references used. Recommendations received will be placed before regular meetings of the Provincial Apprenticeship Committee.

SAFETY EDUCATION

Safe working procedures and conditions, accident prevention and the preservation of health is of primary importance in the Apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of the government, employers, employees and the general public. Therefore, it is imperative that all stockholders become aware of circumstances that may lead to injury or harm and that safe learning experiences and environment can be created by controlling the variables and behaviors that may contribute to or cause an accident and/or an injury.

It is generally recognized that a safe attitude contributes to an accident free environment. As a result a healthy safe attitude towards accidents will benefit an employee by helping to avoid injury, loss of time and loss of pay.

A tradesman is possibly exposed to more hazards than any other person in the work force and therefore, should be familiar with the Occupational Health and Safety Act and Regulations dealing with his own personal safety and the special safety rules applying to each job.

LEGAL AND ADMINISTRATIVE ASPECTS

Employer's Responsibilities:

Accident prevention and the provisions of safe working conditions are the responsibilities of an employer. The company is responsible for:

1. The provision and maintenance of safety equipment
2. The provision of protective devices and clothing (as required by the Occupational Health & Safety Act, General Safety Regulations)
3. The enforcement of safe working procedures
4. Adequate safeguards for machinery, equipment and tools
5. Observance of all accident prevention regulations
6. Adequate training to allow a worker to use or operate equipment in an effective and safe manner.

Government's Responsibilities:

The Apprenticeship and Trade Certification Division in conjunction with the respective Provincial Apprenticeship Committee assumes the responsibility to assure that adequate safety is reflected in the curriculum and that adequate safety instruction is presented at the training establishments.

The Occupational Health and Safety Inspection Branch assumes the responsibility for periodic inspection of the operation to ensure that regulations for industry are being correctly observed.

Individual's Responsibilities:

The employee is responsible for:

1. Knowing and working in accordance with the safety regulations pertaining to job environment and
2. Working in such a way as not to endanger himself or his fellow employees

The major factor in safety is the individual employee, his personal attitude toward safety and having an awareness of the respective safety regulation.

ELECTRICIAN PROGRAM

Subjects and Time Distribution

First Period	8 Weeks	30 Hours Per Week	240 Hours	Page
Section One:	Theory		80	10
Section Two:	Electrical Trade Problems		40	11
Section Three:	Electrical Code and Plans		40	12
Section Four:	Laboratory		80	14
Second Period	8 Weeks	30 Hours Per Week	240 Hours	Page
Section One:	Theory		80	18
Section Two:	Electrical Trade Problems		40	20
Section Three:	Electrical Code		40	21
Section Four:	Laboratory		80	21
Third Period	8 Weeks	30 Hours Per Week	240 Hours	Page
Section One:	Theory		64	24
Section Two:	Electrical Trade Problems		40	27
Section Three:	Electrical Code and Blueprint Reading		56	28
Section Four:	Laboratory		80	29
Fourth Period	12 Weeks	30 Hours Per Week	360 Hours	Page
Section One:	Theory		60	32
Section Two:	Electrical Applications		96	34
Section Three:	Electronics		120	36
Section Four:	Laboratory		84	37

FIRST PERIOD TECHNICAL TRAINING

SECTION ONE:

THEORY

80 Hours

A. Principles of Electricity and Basic Circuitry

1. Structure of matter
2. Conventional current and electron flow
3. Electrical properties
 - (a) conductors
 - (b) insulators
4. Electromotive force
5. Sources of E.M.F.
6. Voltage, resistance, inductance and capacitance
 - (a) definitions
 - (b) units
7. Ohm's Law
 - (a) principles
 - (b) application in circuitry
8. Temperature — resistance relationship
9. Meter construction
 - (a) ammeter
 - (b) voltmeter
 - (c) ohmmeter
 - (d) wattmeter
 - (e) megger
 - (f) meter shunts and multipliers
10. Principles of meter movements
 - (a) d'arsonval
 - (b) electro-dynamometer
11. Kirchhoff's law for voltage and current
12. D.C. generator and motor principles
13. Voltage and current relationship
14. Line loss
15. Work energy and power (electrical and mechanical)
16. Cells and batteries
 - (a) primary cells
 - (b) secondary cells
 - (c) commercial cells
 - (i) lead acid
 - (ii) nickel cadmium

- (iii) gel cells
- (iv) operation
- (v) hazards and precautions
- (vi) ratings
- (vii) applications
- (viii) charging-industrial
- (ix) dry cell charging
- (x) testing
- (xi) temperature effects
- (xii) causes of failures — maintenance
- (xiii) cells in series and parallel

17. Magnetism

- (a) magnetic materials
- (b) lines of force, flux density and permeability
- (c) attraction and repulsion
- (d) electromagnetism
- (e) magnetic fields around conductors
- (f) hand rules
- (g) saturation

18. Electromagnetic induction

- (a) principles
- (b) Faraday's law
- (c) direction of induced E.M.F.
- (d) Lenz's law
- (e) self induction
- (f) mutual induction

19. Introduction to alternating current principles

- (a) generation of an alternating current
- (b) the sine wave
- (c) cycles, frequency and electrical degrees
- (d) unit of frequency, the hertz
- (e) instantaneous, RMS and average values of A.C.

SECTION TWO: ELECTRICAL TRADE PROBLEMS

40 Hours

A. Conductors

1. Introduction to wire sizes

B. Ohm's Law

1. Application in circuitry

C. Resistors

1. Application in circuitry
 - (a) series
 - (b) parallel
 - (c) series-parallel

D. Direct Current

1. Application in circuitry
 - (a) series
 - (b) parallel
 - (c) series-parallel
2. Line loss
3. Three wire distribution system
4. Battery Circuits
5. Resistance of conductors
6. Work energy and power

E. Instruments (Meters)

1. Sensitivity
2. Shunts

F. Torque, Horsepower and Efficiency of Machines

G. Alternating Current

1. Values
 - (a) instantaneous
 - (b) RMS
 - (c) average

H. Basic Trigonometric Functions

1. Sine
2. Cosine
3. Tangent

I. Graphs

1. Plotting and interpretation

SECTION THREE: ELECTRICAL CODE AND PLANS

40 Hours

A. Canadian Electrical Code — Part 1

1. Trade definitions and terminology
 - (a) section 0 (as it applies to first period training)
2. General rules
 - (a) section 2
 - (b) job safety
 - (i) personal
 - (ii) public

3. Conductors
 - (a) section 4
4. Services and service equipment
 - (a) section 6
 - (i) items pertaining to single occupancy overhead and underground services only
 - (ii) system grounding and service equipment bonding (section 10)
5. Circuit loading and demand factors of single family dwelling
 - (a) section 8
 - (i) area determination
 - (ii) number of branch circuit positions
 - (iii) branch circuits for one electric range
 - (iv) connected loads
 - (v) minimum number of 15 amp branch circuits
 - (vi) equipment grounding (section 10)
6. Wiring methods
 - (a) section 12
7. Installation of electrical equipment
 - (a) section 26
 - (i) storage batteries
 - (ii) receptacles
 - (iii) receptacles in residential occupancies
 - (iv) branch circuits in residential occupancies
 - (v) electric heating and cooking appliances
 - (vi) heating equipment
8. Installation of lighting equipment
(except — electric discharge lighting)
 - (a) section 30
 - (i) installation of lighting equipment
 - (ii) wiring of lighting equipment
 - (iii) grounding of lighting equipment
 - (iv) lampholders
9. Plans and diagrams
 - (a) abbreviations and symbols
 - (b) terminology
 - (c) introduction to architectural drawings
 - (d) introduction to electrical drawings
 - (i) schematic — sequence
 - (ii) block
 - (iii) wiring
 - (iv) interconnection
 - (e) single phase overhead and underground service
 - (f) plan of a simple residential electrical installation
 - (i) layout
 - (ii) take-off

A. Soldering and Splicing Techniques for Low Voltages

1. Basic soldering and de-soldering
2. Thermit welding (demonstration, theory and safety)
3. Mechanical wire and cable connectors
4. Insulating splices and joints
5. Copper/aluminum connections

B. Basic Switching and Lighting Circuits

1. Development of drawings and schematics
2. Experiments with bell circuits
 - (a) single bell and button circuit
 - (b) multiple bell and button circuit
 - (c) return call circuits
 - (d) unsupervised systems
 - (e) supervised systems
 - (f) annunciator circuits
 - (g) alarm circuits
3. Experiments with lighting circuits
 - (a) single pole circuits
 - (b) double pole circuits
 - (c) three way switching
 - (d) four way switching
 - (e) low voltage remote control circuits
 - (f) extra low voltage control circuits
4. Basic fire alarm systems
 - (a) single stage supervised multizone

C. Basic Magnetic Switching and Applications

1. Relays
 - (a) construction
 - (b) operation and connection
 - (c) nameplate data
 - (d) types
 - (i) single contact
 - (ii) multi-contact
 - (iii) enclosed and open contacts
 - (iv) plug in bases
 - (v) latching mechanical reset
 - (vi) latching electrical reset
2. Stop-start station

D. Use and Applications of Meter

1. Ammeter
2. Voltmeter
3. Ohmmeter
4. Wattmeter
5. Megger
6. Meter shunts and multipliers
7. Storage of meters
8. Safety and meter protective devices

E. Voltage and Current Measurements

1. Series
2. Parallel
3. Series — parallel

F. Resistors

1. Fixed resistors
 - (a) construction methods
 - (b) determining value
2. Variable resistors
 - (a) construction methods
 - (b) connection as rheostat
 - (c) connection as potentiometer
3. Colour coding

G. Conductors

1. Basic types
2. Terminations
3. Copper
4. Aluminum
5. Cold flow in aluminum
6. Fibre optics
 - (a) basic types
 - (b) principle

H. Job Safety

1. Tools and application of tools

2. Equipment
 - (a) hazards
 - (b) precautions

I. General Safety Precautions

1. Personnel
2. Public
3. Tools and uses
 - (a) hand
 - (b) power

J. Explosive Actuated Tools

(This is a 6 hour course designed to provide)

1. Instruction in safety
2. Instruction in use and applications
3. Instruction in care, maintenance and operation
4. Practical experience in firing
5. Theory
 - (a) types of tools, fasteners and charges
 - (b) high velocity and low velocity tools
 - (c) operating principles of tools
 - (d) safety design features in tools
 - (e) various types of fasteners and charges
 - (f) safety codes and regulations
 - (g) causes of misfiring
 - (h) operator's responsibility
 - (i) supervisor's direction a part of safe operation
 - (j) relationship between pins, charges and materials
 - (k) hidden features of fastening surfaces
6. Practical
 - (a) demonstration of minimum service of all common tools
 - (b) major service responsibility of supplier
 - (c) correct and safe storage of tools and charges
 - (d) disposal misfired charges
 - (e) demonstration of the actual firing of
 - (i) high velocity 1/4" tool
 - (ii) high velocity 3/8" tool
 - (iii) low velocity explosive actuated tool
 - (iv) low velocity explosive assisted tools
 - (f) operation (participation) in pre-firing conditions
 - (i) check correct personal protection
 - (ii) check work surface (visible and invisible)
 - (iii) check loading of tool
 - (iv) check surroundings for safe firing conditions

- (g) firing (each student to load and fire)
 - (i) one high velocity 1/4" tool
 - (ii) one low velocity explosive actuated tool
 - (iii) one low velocity explosive assisted tool

NOTE: Test designed by the training institute teaching the course.

SECOND PERIOD TECHNICAL TRAINING

SECTION ONE:

THEORY

80 Hours

A. AC Principles and Basic Circuitry

1. Review of fundamental concepts (SI, etc.)
2. Values
 - (a) maximum
 - (b) average
 - (c) RMS
3. Circuit phase relationships
4. AC circuit phase relationships
 - (a) phasors
 - (b) phasor diagrams
 - (c) application

B. Inductance and Inductive Circuits

1. Voltages of self induction
2. Units
 - (a) inductance
 - (b) reactance
3. Lenz's law
4. Effect of inductance
5. Factors affecting
 - (a) inductance
 - (b) inductive reactance
6. Inductive circuits
 - (a) phase relationships
 - (b) RL constant and graphs

C. Capacitance and Capacitive Circuits

1. Capacitors
2. Units of capacitance
3. Effect of capacitance
4. Factors affecting capacitance
5. Capacitive reactance
6. Capacitive circuits
 - (a) phase relationships
 - (b) RC constant and graphs

D. Impedance

1. Fundamental concepts
 - (a) units
 - (b) formula
2. Factors affecting impedance
3. Impedance triangle
4. Phase relationships

E. Basic Circuitry

1. Single phase circuits
 - (a) series and parallel
 - (i) combinations of R, X and Z
 - (ii) voltage and current relationships in RLC circuits
2. Power and power factors
 - (a) active power
 - (b) reactive power
 - (c) apparent power
 - (d) causes of low power factor using capacitors
 - (e) power factor of a motor

F. Single Phase Transformers

1. Transformer action
2. Construction
3. Polarity
 - (a) standard labelling of leads
4. Ratings and name plate data
5. Ratios
 - (a) ratio of transformation
 - (b) turns of ratio
 - (c) tap changers
6. Cooling methods
7. Output voltage (introduction to terms)
 - (a) loading effect
 - (b) impedance voltage
 - (c) reactance voltage
 - (d) resistance voltage
8. Types
 - (a) dry type
 - (b) oil cooled
 - (c) class 2
 - (d) instrument
 - (i) potential
 - (ii) current

9. Losses
 - (a) efficiency

G. Introduction to Common Three Phase Systems

1. Three phase voltages
 - (a) principles
2. Wye and delta connected circuits
 - (a) voltage and current relationships

SECTION TWO: ELECTRICAL TRADE PROBLEMS

40 Hours

A. Refresher Coverage — Algebraic Solution of Basic Electrical Problems

B. Trigonometry

1. Sine
2. Cosine
3. Tangent
4. Problems involving the right triangle
5. Angular measurement
6. Rectangular and polar co-ordinates

C. Phasors

1. Fundamental concepts
2. Components of vectors
3. Vectors as applied to electric circuits
4. Addition and subtraction of vectors using the component method

D. Problems

1. Series and parallel circuits with all possible combinations of resistance, reactance and impedance in single phase A.C.
2. Power and power factor
3. Resonance and time constants
4. Transformers
 - (a) ratio
 - (b) tap selection
 - (c) fault current capability

SECTION THREE:**ELECTRICAL CODE****40 Hours****A. Canadian Electrical Code — Part I**

1. Services and service equipment
(a) section 6
2. Circuit loading and demand factors
(a) section 8
 - (i) residential structures
 - (ii) apartments and automobile heater receptacles
 - (iii) motels
3. Grounding
(a) section 10
 - (i) those items referred to by other code sections being studied in second period
4. Class 1 and class 2 circuits
(a) section 16
5. Hazardous locations
(a) section 18
6. Gasoline dispensing and service stations, garages and bulk storage plants
(a) section 20
7. Locations in which corrosive liquids or vapours or excessive moisture are likely to be present
(a) section 22
8. Patient care areas in hospitals
(a) section 24
9. Capacitors for p.f. correction
(a) section 26
10. Installation of lighting equipment
(a) section 30
 - (i) electric-discharge lighting systems
11. Fire alarm system
(a) section 32
12. Emergency systems and unit equipment
(a) section 46
13. Plans and diagrams
(a) sections 8, 10 and 18

SECTION FOUR:**LABORATORY****80 Hours****A. Experiments**

1. Inductive circuits
2. Inductive reactance

3. Capacitive circuits
4. Capacitive reactance
5. Impedance
6. Single phase circuits
 - (a) series and parallel
 - (i) combinations of R, X and Z
 - (ii) voltage and current relationships in RLC circuits

B. Magnetic Switching of AC Circuits

1. Relays and contactors
2. Simple relays
 - (a) principles
 - (b) operation
3. Applications of relays to magnetic switches
4. Magnetic switches
 - (a) principles
 - (b) characteristics
 - (c) maintenance
5. Contacts
 - (a) copper
 - (b) silver
 - (c) weld resistant alloys
6. Pilot circuit devices
 - (a) momentary contact
 - (b) maintained contact
 - (c) push button start-stop station
 - (d) float switching
 - (i) mechanical
 - (ii) bulb
 - (iii) capacitive probe
 - (e) pressure switches
 - (f) limit switches
 - (i) mechanical
 - (ii) proximity
7. Circuits and connections
 - (a) start-stop stations
 - (b) magnetic line starters
 - (c) electrical interlocking
 - (d) mechanical interlocking
 - (e) trouble shooting
 - (f) development of schematics and diagrams
 - (g) control transformers

C. Manual Line Starters

1. Types
2. Purposes
3. Applications

D. Heating and Cooling Controls

1. Principles of automatic controls
 - (a) in heating systems
 - (b) in cooling systems
2. Principles of thermostatic temperature detection
3. Control components
 - (a) solenoid valve
 - (b) diaphragm valve
 - (c) thermostat
 - (d) clock thermostat
 - (e) modulating valve operators
 - (f) humidistat
 - (g) thermopile
 - (h) oil burner flame proofing devices
 - (i) control transformers
 - (j) air switches
4. Thermopile powered control systems
5. Heating systems
 - (a) domestic forced air
6. Cooling systems
 - (a) domestic
7. Development of schematics and diagrams
8. Domestic auxiliary control devices
 - (a) power humidifier
 - (b) electronic filter
9. Safety devices

E. Trouble Shooting

Safety and General Procedures For:

1. Motor control systems with:
 - (a) multiple stations
 - (b) pilot devices
 - (c) separate and common control
 - (d) manual and automatic reset overloads
2. Heating controls

THIRD PERIOD TECHNICAL TRAINING

SECTION ONE:

THEORY

64 Hours

A. Alternating Current Fundamentals

1. Review of single phase
 - (a) phase voltages and current
 - (b) E, I, R, XC, XL and Z relationships and affecting factors
 - (c) true power, apparent power and reactive power
 - (d) phasor diagrams
 - (e) leading and lagging P.F. loads
 - (f) power factor and its effect on line current
 - (g) resonance (hazards — R.L.C. series circuit)
 - (h) power factor correction
 - (i) energy — definition — simple cost calculation
2. The three phase system
 - (a) generation of three phase voltages
 - (b) wye connected system
 - (i) voltage and current relationships
 - (c) delta connected system
 - (i) voltage and current relationships
 - (d) power in three phase systems (balanced and unbalanced loads)
3. Three phase power and energy measurement
 - (a) power measurement circuitry and applications
 - (i) one wattmeter method
 - (ii) two wattmeter method
 - (iii) three wattmeter method

B. Three Phase Induction Motors

1. General construction features
 - (a) frame
 - (b) rotor and stator (squirrel cage, wound rotor)
 - (c) name plate data
 - (d) identification of leads
2. The rotating magnetic field
 - (a) direction of rotation
 - (b) speed of rotation
3. Synchronous speed, rotor speed, slip speed
4. Frequency, pole speed relationship
5. Rotor parameters
 - (a) slip
 - (b) rotor frequency, rotor voltage, rotor current
 - (c) rotor reactance, rotor resistance, rotor impedance
 - (d) rotor torque
 - (i) starting

- (ii) breakdown or maximum
 - (iii) rated
- 6. Operating characteristics of squirrel cage motors
 - (a) different EEMAC design rotors (ABCDF)
 - (b) applications of each (EEMAC) design rotor
 - (c) torque, speed, efficiency, power factor at no load to full load operation
 - (d) speed regulation
 - (e) effects of overload and change in line voltage above and below rated
 - (f) single phasing condition — starting, running
 - (g) reversing
 - (h) torque horsepower speed relationship
- 7. The wound rotor motor
 - (a) principles
- 8. Induction of motor
 - (a) losses
 - (b) efficiency
 - (c) ratings
- 9. Connections for dual voltage motors
 - (a) trouble shooting

C. Three Phase Motor Starters and Controllers

- 1. Line starters
 - (a) manual
 - (b) magnetic
- 2. Reduced voltage starters
 - (a) principles and applications
 - (b) manual and automatic
 - (c) resistance starter
 - (d) reactance starter
 - (e) star-delta starter
 - (f) starting compensator
 - (g) part winding starter
- 3. Controllers
 - (a) multi-speed
 - (b) reversing
- 4. Trouble shooting

D. Low Potential Circuit Protective and Switching Equipment

- 1. Short circuits and interrupting capacity
- 2. Electrical distribution system impedances

3. Fuses
 - (a) plug
 - (b) cartridge
 - (c) renewable link
 - (d) high rupturing capacity
 - (e) time lag
 - (f) dual element
 - (g) current limiting
4. Safety switches
5. Ground fault circuit interrupters
6. Ground detection systems
7. Shunt trip moulded case breakers
8. Air circuit breakers
9. Panel board
10. Job safety

E. Unit Sub-Station

1. Above 750 volts
2. Switching
 - (a) key interlocking
 - (b) procedures
3. Job safety
 - (a) working grounds

F. Practical Introduction to Semi-Conductor Diodes and Transistors

1. Junction diodes
 - (a) atomic structure of semi-conductors
 - (b) N-type and P-type doping
 - (c) conduction in semi-conductors
 - (d) P-N junction diode
 - (i) forward bias
 - (ii) reverse bias
 - (e) introduction to diode rectifier circuits
 - (i) half wave
 - (ii) full wave
2. Bi-polar transistors
 - (a) construction
 - (b) doping
 - (c) unbiased transistor (PNP-NPN)
 - (d) forward and reverse bias
3. S.C.R.
 - (a) biasing
 - (b) switching

4. U.J.T.
 - (a) introduction to pulse generation

SECTION TWO: ELECTRICAL TRADE PROBLEMS

40 Hours

A. Review Applications in Single Phase Problems

1. Phase and line voltages and current
2. E, I, R, X_c , X_L and Z relationships
3. True power
4. Apparent power
5. Reactive power
6. Power factor
7. Energy

B. Single Phase Power Factor Correction

C. Single Phase Transformers

1. Ratio
2. Volts per turn
3. Rated Currents

D. Phasors (Three Phase)

1. Balanced load
2. Unbalanced load

E. Three Phase Calculations

1. Voltage, current and power
 - (a) wye
 - (b) delta
 - (c) balanced load
 - (d) unbalanced load

F. Power Measurement

1. One wattmeter method with two C.T.'s
2. Two wattmeter method
3. Three wattmeter method

G. Three Phase Power Factor Correction

H. Three Phase Motor Calculations

1. Voltage, current, horsepower
2. Efficiency and power factor
3. Frequency, pole-speed relationship
4. Slip, speed of rotation
5. Torque, horsepower relationships
6. Starting characteristics
 - (a) torque
 - (b) current
7. Reduced voltage starting
 - (a) voltage, current, torque relationship
8. Induction motor
 - (a) losses
 - (b) efficiency
 - (c) ratings

SECTION THREE: ELECTRICAL CODE AND BLUEPRINT READING

56 Hours

A. Canadian Electrical Code — Part I

1. Grounding — section 10
2. Protection and control — section 14
3. Installation of electrical equipment — section 26
4. Motors and generators — section 28
5. High — voltage installation — section 36
6. Swimming pools — section 68
 - (a) ground fault circuit interrupters
 - (b) underground wiring
 - (c) permanently installed swimming pools
 - (d) storable swimming pools
 - (e) therapeutic pools
7. Mobile home and recreational vehicle parks — section 72
8. Temporary wiring — section 76

B. Print Interpretation

1. Sets of drawings
 - (a) architectural
 - (b) structural
 - (c) mechanical
 - (d) electrical

2. Plans
 - (a) elevations
 - (b) sections
 - (c) details
3. Plot plans
4. Basement and floor plans
5. Sub trades specifications
6. Reading plans and specifications
 - (a) symbols
 - (b) schematics
7. Materials take-off
 - (a) basic wiring materials

SECTION FOUR:

LABORATORY

80 Hours

A. P.T.'s, C.T.'s, Voltmeter and Ammeter Transfer Switches

1. Purpose
2. Precautions
3. Circuit connections

B. Transformation

1. Single phase transformer
 - (a) review of principles
 - (b) connections for two wire circuit
 - (c) polarity
 - (d) labelling of leads
 - (e) turns ratio
 - (f) connections for three wire circuits
 - (g) series and parallel winding connections
 - (h) hazard of backfeed
 - (i) limitations
 - (j) circuit diagrams
 - (k) single phase transformer paralleling
 - (l) ratings
 - (m) tap changers
2. Three phase transformers and transformer banks
 - (a) voltage, current and power relationships in
 - (i) wye connections
 - (ii) delta connections
 - (iii) open wye connections
 - (iv) open delta connections
 - (b) ratio of transformation
 - (c) regulation
 - (d) short circuit conditions in relation to %IZ

- (e) transformer connections
 - (i) delta — delta
 - (ii) wye — wye
 - (iii) open delta — open delta
 - (iv) open wye — open delta
 - (v) delta — wye
 - (vi) wye — delta
 - (vii) four wire delta
 - (f) the three phase transformer
 - (g) transformer banks
 - (h) concerns for paralleling of transformer banks
3. The auto transformer
- (a) principles
 - (b) ratings (transformed and handled KVA)
 - (c) applications
 - (d) safety precautions

C. Power and Energy Measurement

- 1. One wattmeter
- 2. Two wattmeter
- 3. Three wattmeter
- 4. KWH meter base demonstration
 - (a) single phase 2 wire, 120 volt self-contained
 - (i) 4 jaw
 - (b) single phase 3 wire, 120/240 volt self-contained
 - (i) 4 jaw
 - (ii) 200 amp max
 - (c) 3 wire, network, 120/208 volts self-contained
 - (i) 5 jaw
 - (ii) 200 amp max
 - (d) three phase 4 wire delta circuit, 120/240 volt self-contained
 - (i) 7 jaw
 - (ii) 200 amp max
 - (e) three phase 4 wire wye circuit, 120/208, 277/480 or 347/600 self-contained
 - (i) 7 jaw
 - (ii) 200 amp max

D. Three Phase Induction Motors

- 1. Identification of leads
 - (a) 9 lead dual voltage
 - (i) wye
 - (ii) delta
- 2. Dual voltage connections
 - (a) wye
 - (b) delta
- 3. Multi-speed connections
 - (a) two winding — two speed

- (b) one winding — two speed consequent pole
 - (i) constant horsepower
 - (ii) constant torque
 - (iii) variable torque
- (c) two winding — four speed consequent pole
 - (i) constant horsepower
 - (ii) constant torque
 - (iii) variable torque

4. Multi-power connections

E. Three Phase Motor Controllers

- 1. Manual and automatic reduced voltage starters
 - (a) resistance starter
 - (b) reactance starter
 - (c) star delta starter
 - (d) starting compensator
 - (e) part winding starter
- 2. Multi-speed motor controllers

F. Phase Converters — Single and Three Phase

- 1. Mechanical
- 2. Electronic

FOURTH PERIOD TECHNIAL TRAINING

SECTION ONE:

THEORY

60 Hours

A. Review of First, Second and Third Period Theory

1. Basic D.C. circuits
2. Basic A.C. circuits
3. Single phase three wire systems
 - (a) balanced
 - (b) unbalanced
4. Three phase A.C. systems
 - (a) wye
 - (b) delta
 - (c) power
 - (i) balanced
 - (ii) unbalanced
 - (d) power factor
5. Electrical machines
 - (a) work
 - (b) power
 - (c) torque
 - (d) speed
 - (e) power factor

B. Direct Current Machines

1. Principles
2. Types
 - (a) series
 - (b) shunt
 - (c) compound
3. Characteristics
4. Armature reaction
5. Interpoles and compensating winding
6. Output characteristics
 - (a) losses
 - (b) efficiency
 - (c) torque
 - (d) speed
 - (e) regulations of output
 - (f) control
7. Reversing polarity
8. Reversing rotation

9. Changing field excitation
10. Starting and control
 - (a) requirements
 - (b) typical equipment
11. Applications
 - (a) D.C. motors
 - (b) nameplate data
12. Wiring diagrams and schematics

C. A.C. Generators and Alternators

1. Construction
2. Characteristics
3. Voltage generation
4. Losses and efficiency
5. Effects of changing field excitation
6. Voltage regulation
7. Effects of load on voltage regulation under conditions of
 - (a) unity power factor
 - (b) leading power factor
 - (c) lagging power factor
8. Voltage regulator principles
9. Parallel operation principle
 - (a) phasing out
 - (b) synchronizing
 - (c) division of load (kW and kVARS)
 - (d) hunting
 - (e) synchronizing equipment

D. Single Phase A.C. Motor

1. Principles, characteristics and application of
 - (a) series A.C. (universal)
 - (b) split phase
 - (c) capacitor split-phase motors
 - (i) capacitor start
 - (ii) permanent-split capacitor
 - (iii) two valve capacitor
 - (d) shaded pole
 - (e) synchronous
 - (f) repulsion — induction
2. Connections and diagrams
 - (a) single and dual voltage
 - (b) multiple speed

- (c) reversing
- (d) current and voltage starting relays
- 3. Protection
 - (a) built in thermal
 - (b) current relays
 - (c) overload relays
- 4. Multi-power connections

E. Three Phase Synchronous Motors

- 1. Construction
- 2. Operation
 - (a) principles
 - (b) characteristics
 - (i) effects of loading on power factor
 - (ii) effects of field excitation on power factor and torque
- 3. Application
 - (a) mechanical
 - (b) synchronous condenser
 - (c) power factor correction
- 4. Control equipment
 - (a) starting
 - (b) running

SECTION TWO: ELECTRICAL APPLICATIONS

96 Hours

A. Review of Previous Period Subjects

B. Canadian Electrical Code Part I

- 1. Service and distribution layouts
 - (a) feeders
 - (b) subdivisions
 - (c) branch circuits
 - (d) neutral and common conductor
- 2. Protection and control
- 3. Installation of electrical equipment
- 4. Special locations
 - (a) hazardous areas
 - (b) damp locations
 - (c) corrosive locations
- 5. High potential installations
 - (a) cable terminations
 - (b) stress cones

- (c) potheads
- (d) grounding

C. Lighting

1. Definition of terms
 - (a) light
 - (b) illumination intensity
 - (c) foot-candle
 - (d) lumens
 - (e) lumens per watt
2. Incandescent lighting
 - (a) lamps
 - (b) characteristics
 - (c) installation and maintenance
3. Fluorescent lighting
 - (a) theory of operation
 - (b) lamps
 - (i) construction
 - (ii) types
 - (iii) characteristics
 - (c) ballasts
 - (i) basic preheat switch start circuit
 - (ii) basic instant start circuit
 - (iii) rapid start
 - (d) installation and maintenance
4. High-intensity discharge (HID)
 - (a) theory of operation
 - (b) lamps
 - (i) construction
 - (ii) types
 - (iii) characteristics
 - (c) ballasts
 - (i) reactor ballast
 - (ii) regulated output ballast
 - (iii) two lamp lead lag ballast
 - (d) self ballaster lamps
 - (e) installation and maintenance
 - (f) comparison of different lighting systems
 - (i) sodium
 - (ii) high and low pressure
 - (iii) metal halide
 - (iv) efficiency
5. Calculations for lighting installations
6. Retrofit lighting

SECTION THREE: ELECTRONICS

This section is to reflect actual field applications

A. Proper Use and Interpretation of	60 Hours
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1. Multimeters
2. Oscilloscopes
3. Power supplies
4. Possible hazards due to case-to-ground potentials

B. Semi-conductors

1. Basic theory
2. PN junction (diode)
3. Zener diode and use as a regulator
4. Transistors
 - (a) unijunction
 - (b) NPN and PNP
 - (i) concept of proper polarities
 - (ii) concept of relationship of base to collector currents
5. Four layer devices
 - (a) diac
 - (b) triac
 - (c) SCR
6. Cells
 - (a) photoconductive
 - (b) photovoltaic — principle
7. Concept of integrated circuits
 - (a) trends
 - (b) introduction to operational amplifiers
 - (c) introduction to logic
8. Concept of heat sinking and isolation

C. Circuitry	60 Hours
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1. Rectifiers
 - (a) single phase
 - (b) three phase
 - (c) use of SCR's in rectifiers
2. Introduction to filters
 - (a) capacitor
 - (b) choke
 - (c) L-section
3. NPN and PNP transistor circuitry illustrating
 - (a) use as a current amplifier connecting variable resistance sensors to relays
 - (b) as a high current switch using low control currents

4. SCR
 - (a) for phase control
 - (b) as a switch
5. The UJT relaxation oscillator for an SCR trigger
6. Triac
 - (a) as a switch
 - (b) use for phase control
7. D.C. motor control circuits
8. Inverters and variable frequency drives
9. Timers
10. Field excitation
11. Industrial battery charger
12. Voltage regulator
13. Reduced voltage starter for induction motors
14. Miscellaneous — Demo
 - (a) surge suppressors
 - (b) mounting components
 - (c) P.C. board care
 - (d) soldering

SECTION FOUR:

LABORATORY

84 Hours

A. Direct Current Machines

1. Operating characteristics
 - (a) series
 - (b) shunt
 - (c) compound
2. Effects of interpoles
3. Reversing polarity
4. Reversing rotation
5. Changing field excitation
6. Manual starting and control
 - (a) requirements
 - (b) typical equipment
7. Maintenance operations
 - (a) tests
 - (i) shorts and opens
 - (ii) insulation resistance
 - (iii) grounds
 - (iv) armature

- (v) field coils
 - (vi) interpoles
- (b) maintenance
 - (i) commutator and brushes
 - (ii) lubrication
- 8. Mechanical maintenance
 - (a) vee belts
 - (i) types
 - (ii) tension requirements
 - (iii) applications
 - (iv) replacements
 - (b) vee belt pulleys
 - (i) installing
 - (ii) aligning
 - (c) direct coupling

B. A.C. Generators and Alternators

1. Construction
2. Characteristics
3. Effects of changing field excitation
4. Effects of load on voltage regulation under conditions of
 - (a) unity power factor
 - (b) leading power factor
 - (c) lagging power factor
5. Parallel operation
 - (a) phasing out
 - (b) synchronizing
 - (c) division of load (kW and kVARs)
 - (d) hunting
6. Synchronizing

C. Single Phase A.C. Motor

1. Characteristics and application of
 - (a) connections
 - (i) forward
 - (ii) reverse
 - (b) dual voltage
 - (c) multiple speed
2. Protection
 - (a) built-in thermal
 - (b) current relays
 - (c) overload relays
3. Testing and trouble shooting

D. Synchronous Motors

1. Construction
2. Operation
 - (a) principles
 - (b) characteristics
 - (i) effects of loading on power factor
 - (ii) effects of field excitation on power factor and torque
3. Application
 - (a) mechanical
 - (b) synchronous condenser
 - (c) power factor correction
4. Control equipment

E. Magnetic Starters

1. Review basic control circuits
2. Advanced magnetic switch control
 - (a) complete electrical interlocking
 - (b) minimum number of control wires
 - (c) limit switches
3. Wiring diagrams and schematics
4. Trouble shooting control circuits
5. Motor Control Centres

F. Programmable Controller

1. Digital terms
2. General P.C. knowledge
3. Wiring connections
4. Basic programming
 - (a) start/stop station
 - (b) forward reverse magnetic
 - (c) timing circuit
 - (d) counter

G. Supervised Fire Alarm

1. Two stage

SUGGESTED REFERENCE MATERIALS

Electric Circuit & Machines — Latest Edition — E.C. Lister

Canadian Electrical Code — Part I (latest edition)

Application of Electrical Construction — Clidero and Sharp

Alternating Current Fundamentals — Duff

Electric Motor Controls — Alerich — Latest Edition

Electrical Machines' Direct & Alternating Current — Siskind

Transistor Fundamentals and Servicing — Boyd Larson

TECHNICAL TRAINING SCHOOLS

The Electrician apprenticeship training program is offered by the Alberta Manpower, Apprenticeship and Trade Certification Division. Staff and facilities for teaching the program are supplied by Alberta Manpower at:

1. Northern Alberta Institute of Technology
2. Southern Alberta Institute of Technology
3. Lethbridge Community College
4. Keyano College
5. Fairview College
6. Westerra Institute of Technology
7. Lakeland College
8. Red Deer College

LOCATION OF APPRENTICESHIP AND TRADE CERTIFICATION DIVISION REGIONAL OFFICES

CALGARY

EDMONTON

FORT McMURRAY

GRANDE PRAIRIE

HINTON

LETHBRIDGE

MEDICINE HAT

PEACE RIVER

RED DEER

VERMILION

SUGGESTED WORK EXPERIENCE

The following list of suggested "work experience" is provided as a guide for the apprentice to relate application of hand skills with technical training during his apprenticeship program.

First Period

- 1) Basic use of hand tools (i.e. screw drivers, hammers, levels, etc.)
- 2) Proper use of step ladders, extension ladders and scaffolding.
- 3) Use and operation of electric drills.
- 4) Use and operation of manual pipe benders 1/2" to 1-1/4".
- 5) Installation of boxes and headers.
- 6) Installation of loomex and armoured cable.
- 7) Introduction to wire pulling.
- 8) Introduction to simple circuits and connection of switches, receptacles, etc.
- 9) Introduction to the operation of voltmeters, ammeter and ohmmeters.
- 10) Blueprint reading (i.e. house layout, small commercial projects, simple control circuits and symbols)
- 11) Soldering and splicing of wires.
- 12) Simple installation of lighting fixtures.

Second Period

- 1) Introduction to the use of power tools (i.e. benders, power vises, etc.)
- 2) Installation of conduit (rigid, EMT) using benders and hickies.
- 3) Installation of wire for feeders, subfeeders and branch circuits.
- 4) Operation of power equipment (i.e. lifts, drills, power actuated tools).
- 5) Installation of panel boards, breakers and fuse disconnects.
- 6) Installation of control circuits, fire alarm systems, lighting circuits, power distribution and motors.
- 7) Blueprint reading and explanation of architectural drawings.
- 8) Procedure and application of thermo welding.
- 9) Use of meters (i.e. voltmeter, ammeter, ohmmeter, megger).
- 10) Introduction of transformers, their use and connections).
- 11) Application of code which was taught in first period technical training, (sections 0, 2, 4, 6, 8, 10, 12, 26, 30).
- 12) Installation and hanging of fixtures.

Third Period

- 1) Installation of wire in all types of conduit, tray or wireways. Also termination or connection of same.
- 2) Layout and install cable trays and wireways.
- 3) Blueprint reading of control circuits, pipe drawings, power distribution, lighting layouts, motors, services and architectural drawings.
- 4) Connection and testing of magnetic starters, motors, control circuits, combined with use of meters.
- 5) Installation and application of single and three phase transformers.
- 6) Connection of motors single and three phase, electrically and mechanically.
- 7) Installation and connection of fire alarm systems, heating and cooling systems.
- 8) Introduction to high voltage equipment, safety requirements and procedures.
- 9) Installation of service equipment, metering for housing and commercial projects.
- 10) Application of code which was taught in second period technical training, (sections 6, 10, 16, 18, 20, 22, 24, 30, 32, 46).
- 11) Introduction to hazardous area wiring, piping, etc.
- 12) Introduction to trouble shooting.

Fourth Period

- 1) Complete use of all power tools and equipment.
- 2) Extensive use of voltmeters, ammeters, ohmmeters and meggers.
- 3) Installation of panel boards, motor control centres, switchgear and fire alarm systems.
- 4) Wiring for hazardous areas.
- 5) Wiring for commercial installations (i.e. swimming pools, theatres, etc.)
- 6) Installation, wiring and testing of high voltage equipment.
- 7) Blueprint reading, electrical, mechanical and architectural.
- 8) Introduction to supervision and giving of orders.
- 9) Motor and control connections, single phase, dual voltage, multi-speed, and D.C.
- 10) Installation of fire alarm, air conditioning and conveyor systems.
- 11) Application of code which was taught in third period technical training, (sections 10, 14, 26, 28, 36, 68).
- 12) Introduction to electronics using, transistors, rectifiers and filters.

GOVERNMENT OF THE PROVINCE OF ALBERTA

MANPOWER DEVELOPMENT ACT

Electrician Trade Regulation

1(1) In this regulation,

(a) "electrician" means a person engaged in the installation, alteration, repair or maintenance of an electrical system designed to provide heat, light, power, control, signal or fire alarm in or on buildings, structures or premises;

(b) "General Regulations" means the General Regulations (Alta. Reg. 43/77);

(c) "trade" means the trade of electrician.

(2) The definitions in the General Regulations apply in this regulation.

PART 1

Apprenticeship and Trade Training

2 A person is eligible to be an apprentice electrician if he has

(a) satisfied the requirements of section 5 of the General Regulations, and

(b) passed mathematics 20 or its equivalent, or mathematics 23, or passed an entrance examination prescribed by the Board.

3(1) Subject to subsections (2), (3) and (4), an employer who is a journeyman or who employs a journeyman may employ 1 apprentice and 1 additional apprentice for each additional journeyman he employs.

(2) If the supply of journeymen in a location where an employer is carrying on business is insufficient to permit the employer to carry out his work commitments, the Director may authorize the employer to employ apprentices in addition to subsection (1).

(3) The Director may authorize an employer to employ an apprentice, in addition to those under subsections (1) and (2), on a temporary

basis to train him in a branch of the trade not engaged in by the employer to whom he is apprenticed.

(4) For the purpose of subsections (1) and (2), an apprentice employed temporarily under subsection (3) shall not be considered to be apprenticed to his temporary employer.

4(1) The term of apprenticeship shall be 4 periods of 12 months each.

(2) Each period referred to in subsection (1) shall consist of not less than 1800 hours of on the job training, inclusive of time spent attending technical training courses prescribed by the Board.

5 When a contract of apprenticeship is registered with the Director, he shall issue to the apprentice the official record book referred to in section 14 of the General Regulations.

6(1) An apprentice shall not advance to the next period until the Director has authorized him to do so by making an entry in the apprentice's official record book in accordance with subsection (2).

(2) The Director shall make an entry in the official record book of the apprentice authorizing advancement to the next period, when the apprentice

(a) has completed the previous period of apprenticeship,

(b) has received, in the opinion of the Director, a satisfactory report from

(i) his employer, and

(ii) the school at which he attended technical training courses prescribed by the Board,

(c) has completed the tests and examinations prescribed by the Board, and

(d) has attained pass marks prescribed by the Board in the tests and examinations referred to in clause (c).

7 The official record book of an apprentice shall be kept in the possession of his employer and, on termination of the employment of the apprentice, the employer shall present the completed book to him.

8(1) An employer shall pay wages to an apprentice that are not less than the following percentages of the prevailing wages paid to a journeyman:

- (a) 45% in the 1st period;
- (b) 55% in the 2nd period;
- (c) 65% in the 3rd period;
- (d) 75% in the 4th period.

(2) Notwithstanding subsection (1), the wages paid to an apprentice shall not be less than the minimum wage fixed under the *Employment Standards Act*.

(3) An employer is not required to pay wages to an apprentice during the time that the apprentice spends attending technical training courses prescribed by the Board.

9 The hours of work and working conditions of an apprentice shall be the same as those of a journeyman.

PART 2

Certification

10(1) On and after April 1, 1982, Certificates of Proficiency for electricians shall be issued by the Director.

(2) A certificate of proficiency issued by the Electrical Protection Branch of the Department of Labour, pursuant to the *Electrical Protection Act* shall be recognized as a Certificate of Proficiency under this regulation until the date of expiry shown on the pocket identification card for the certificate or the date on which a certificate is issued under subsection (1), whichever is sooner.

11 In accordance with section 49(b) of the General Regulations the Director may issue the following classes of Certificate of Proficiency in the trade:

- (a) Electrician;
- (b) Electrician - 2nd class;
- (c) Temporary.

12 In accordance with section 50(d) of the General Regulations, the Director may issue an Electrician Certificate of Proficiency without examination to a person who holds

(a) a Certificate of Completion of Apprenticeship in the trade issued by another province within Canada prior to January 1, 1962, and

(b) a Certificate of Completion of Apprenticeship, a Certificate of Qualification or a Certificate of Proficiency in the trade issued by another province within Canada bearing an Interprovincial Standards Red Seal.

13 An Electrician - 2nd class or temporary certificate of proficiency entitles the holder to work as an electrician

(a) on circuits of not more than 300 volts with an ampacity of not more than 200 amperes, or

(b) without restriction, while under the supervision of the holder of an Electrician certificate of proficiency.

14 The Director may issue a Temporary Certificate of Proficiency to a person who did not attain the pass mark approved by the Board for an Electrician certificate in his examination but attained a mark of at least 80% of the pass mark.

15(1) An application to take an examination for a Certificate of Proficiency shall be made to the Director.

(2) Documentary evidence acceptable to the Director shall be presented by an applicant for an examination showing that the applicant

(a) holds a certificate equivalent to an Alberta Certificate of Proficiency issued by a provincial authority outside Alberta, or

(b) has at least 5 years of acceptable work experience in the trade.

(3) The applicant shall provide translations into the English language, acceptable to the Director, of credentials in a language other than in English submitted pursuant to subsection (2).

16(1) The holder of a first class electrician certificate or a second class electrician certificate issued under the *Electrical Protection Act*

may apply for a replacement certificate and the Director may issue to the holder

(a) an Electrician Certificate of Proficiency on evidence of a first class electrician certificate, or

(b) an Electrician - 2nd class Certificate of Proficiency on evidence of a second class electrician certificate.

(2) No fee shall be charged for the replacement of an existing certificate pursuant to subsection (1).

17 A Certificate of Proficiency issued under this regulation is effective unless cancelled or suspended by the Director in accordance with section 60 or 61 of the General Regulations or section 48 of the Act.

18 *The Electrician Trade Regulation (Alta. Reg. 150/80) is repealed.*

N.L.C. - B.N.C.



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